

Native sagebrush plant community restoration for sage-grouse habitat

Francis Kilkenny

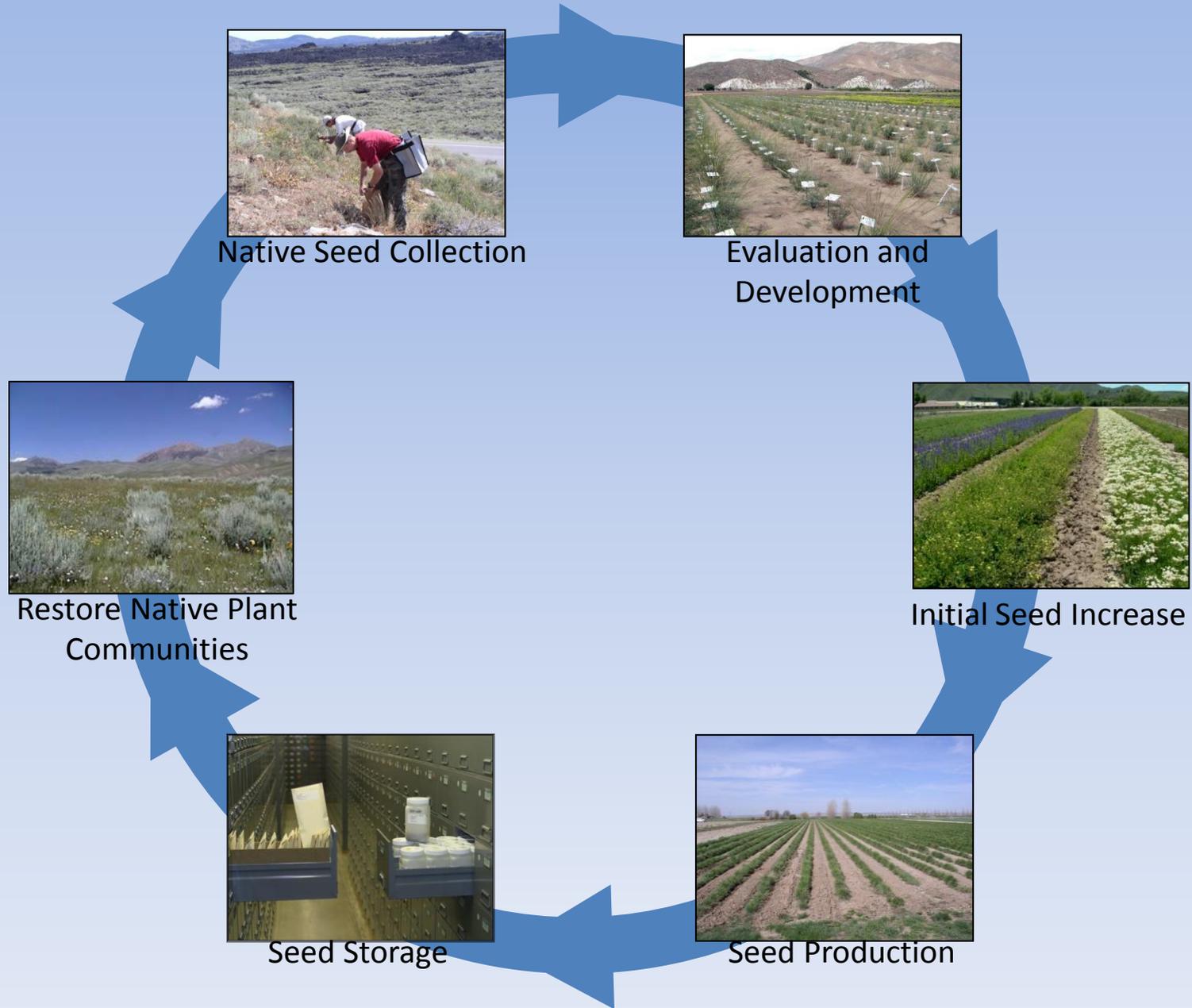
USDA FS Rocky Mountain Research
Station, Boise, ID



Great Basin Native Plant Project



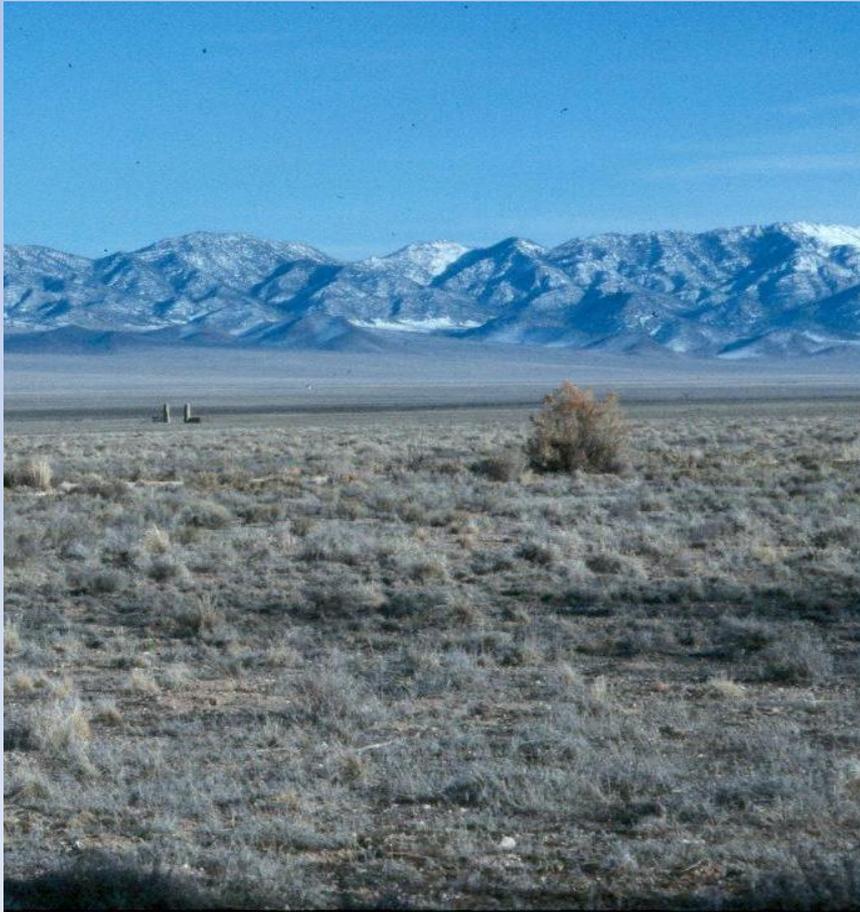
Native plant material restoration cycle



The Great Basin

Total Area: 550,000 km²

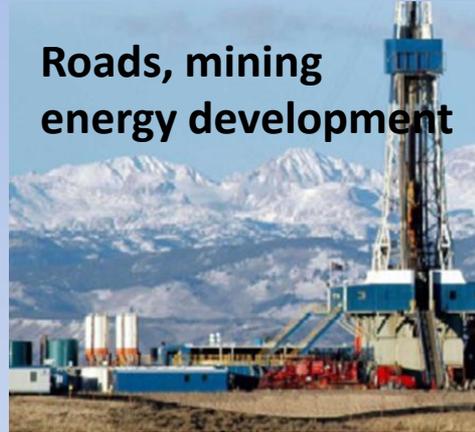
Public Lands: 410,000 km²



Threats to Great Basin ecosystems

- Disturbance
- Invasive species
- Climate change
- Reduced ecosystem function

Roads, mining
energy development



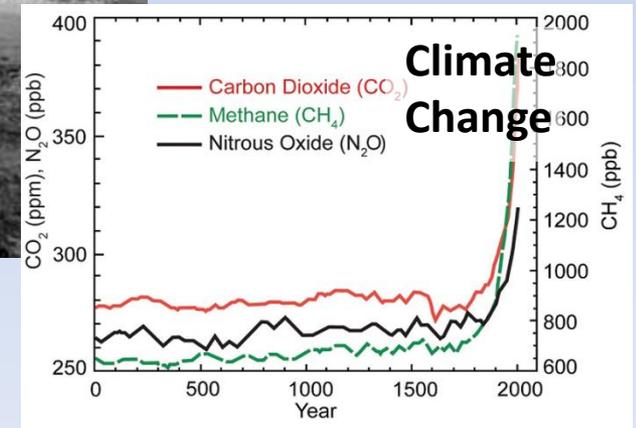
Grazing



Altered fire
regimes



Invasive species

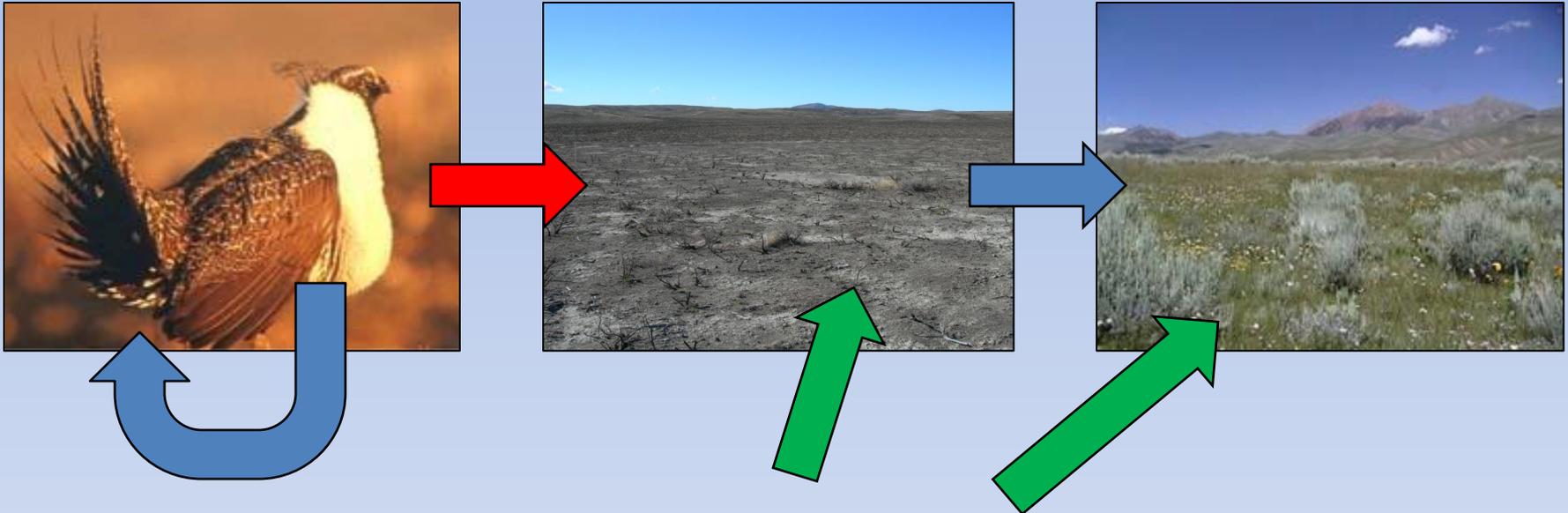


What is our goal?

- Restore native plant diversity
- Restore ecosystem processes and function
- Increase ecosystem stability and resiliency



GBNPP role in sage-grouse conservation



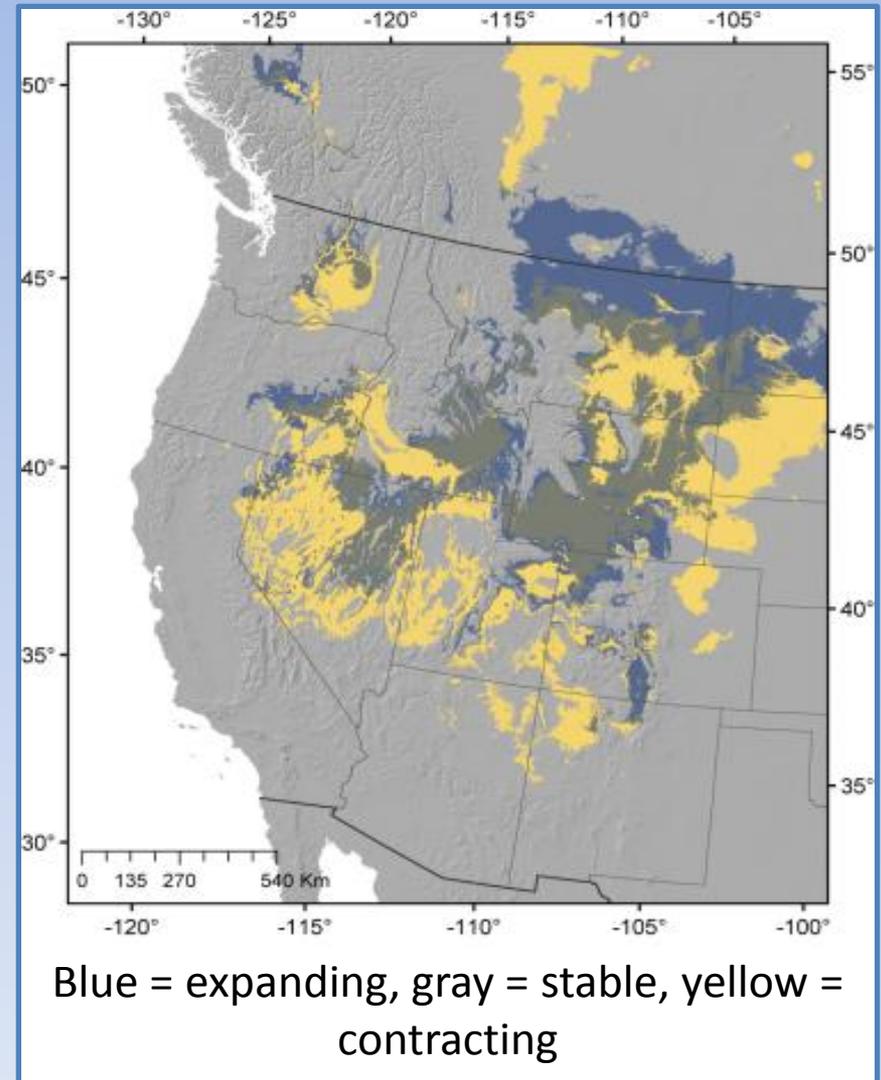
Conservation of
existing habitat

**Native plant material
development and
restoration** of sage-
grouse plant
communities

Sagebrush restoration

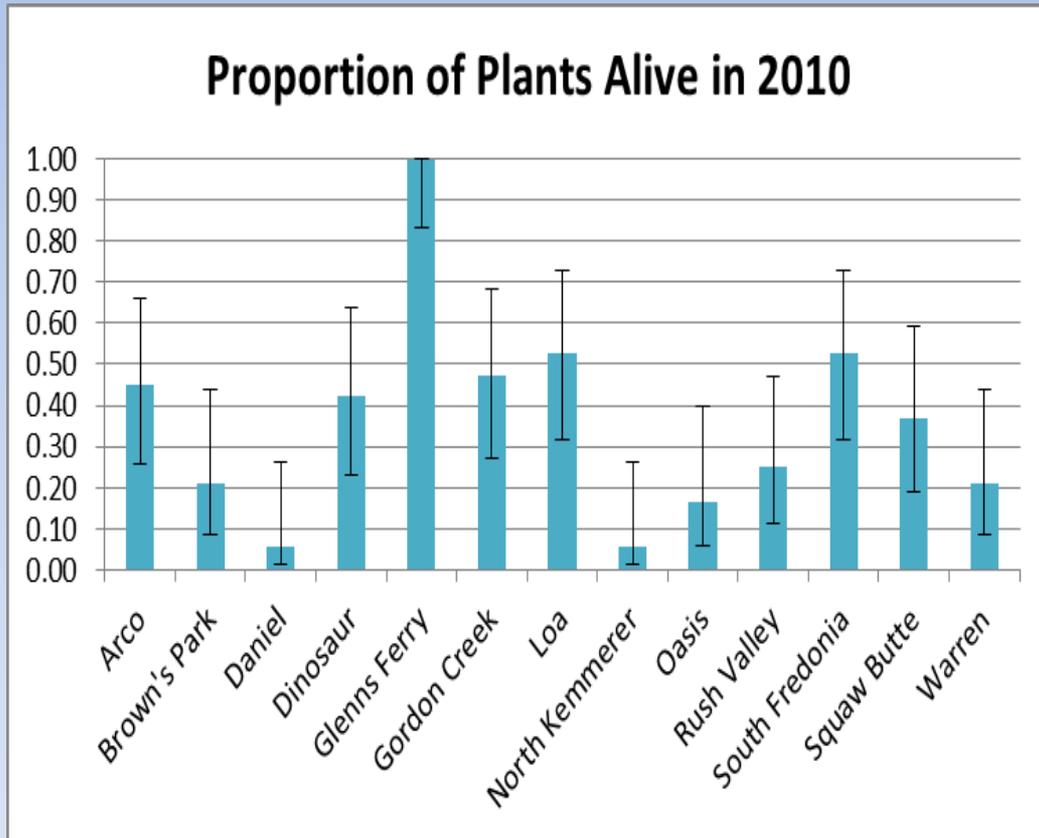
The future Wyoming big sagebrush

- Projected losses occur in areas already experiencing cheatgrass invasion.
- Loss by mid-century (~38%) appears to be different in the eastern vs western region:
 - Eastern region loss: a shift in more summer precip over winter
 - Western region loss: greater aridity and warmth (Mojave)



Sagebrush genetics & adaptation: local source matters

Wyoming Big Sagebrush
Common Garden
Glenns Ferry, Idaho (1987 Planting)

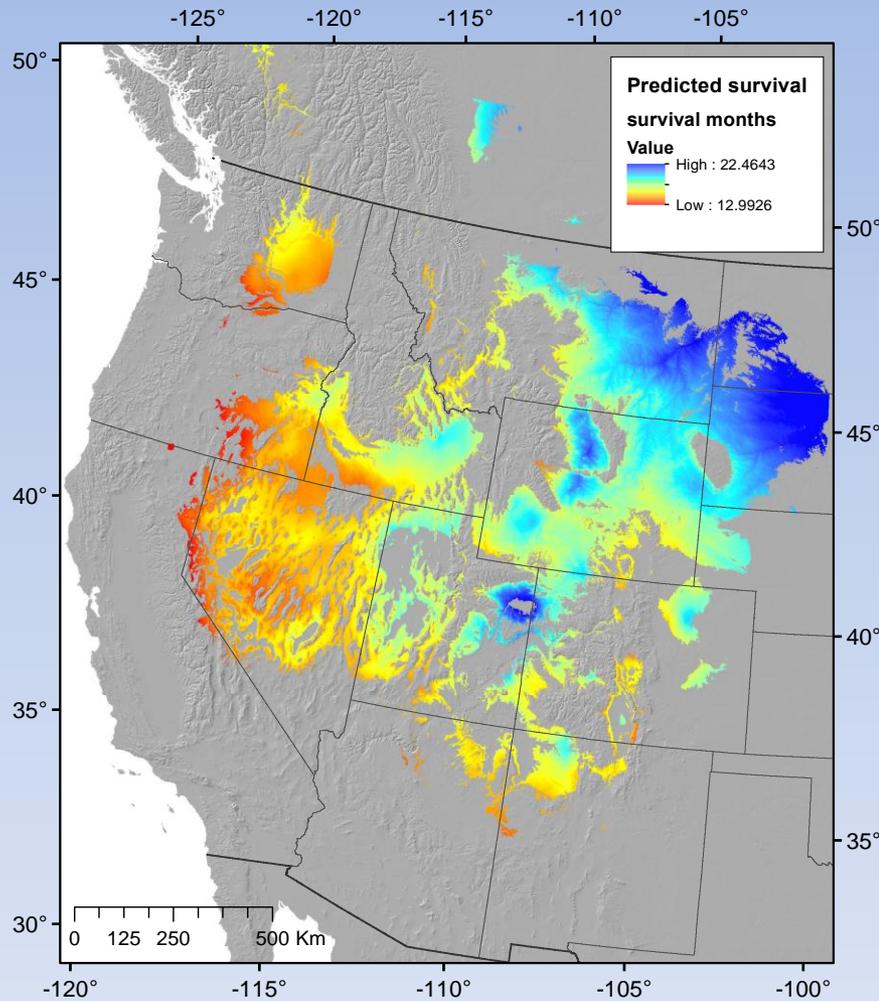


Sagebrush Common Garden, Boise, ID

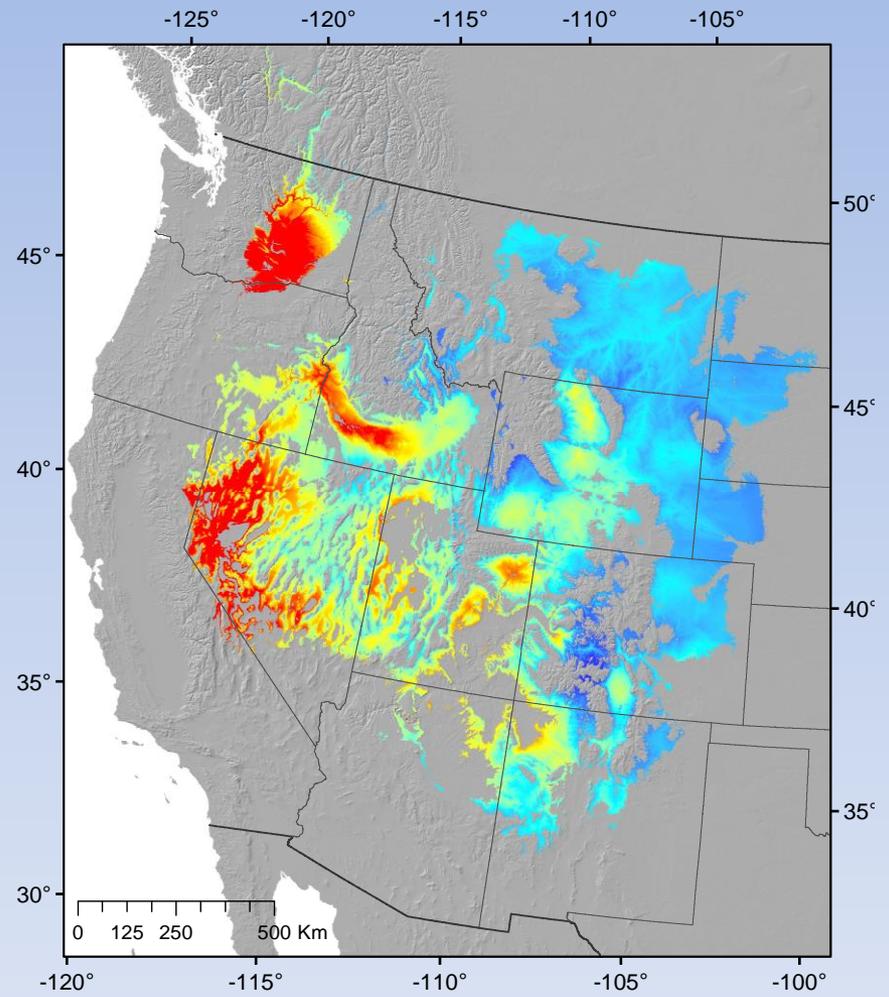


Mountain Wyoming Basin

Genetic models of survival and growth

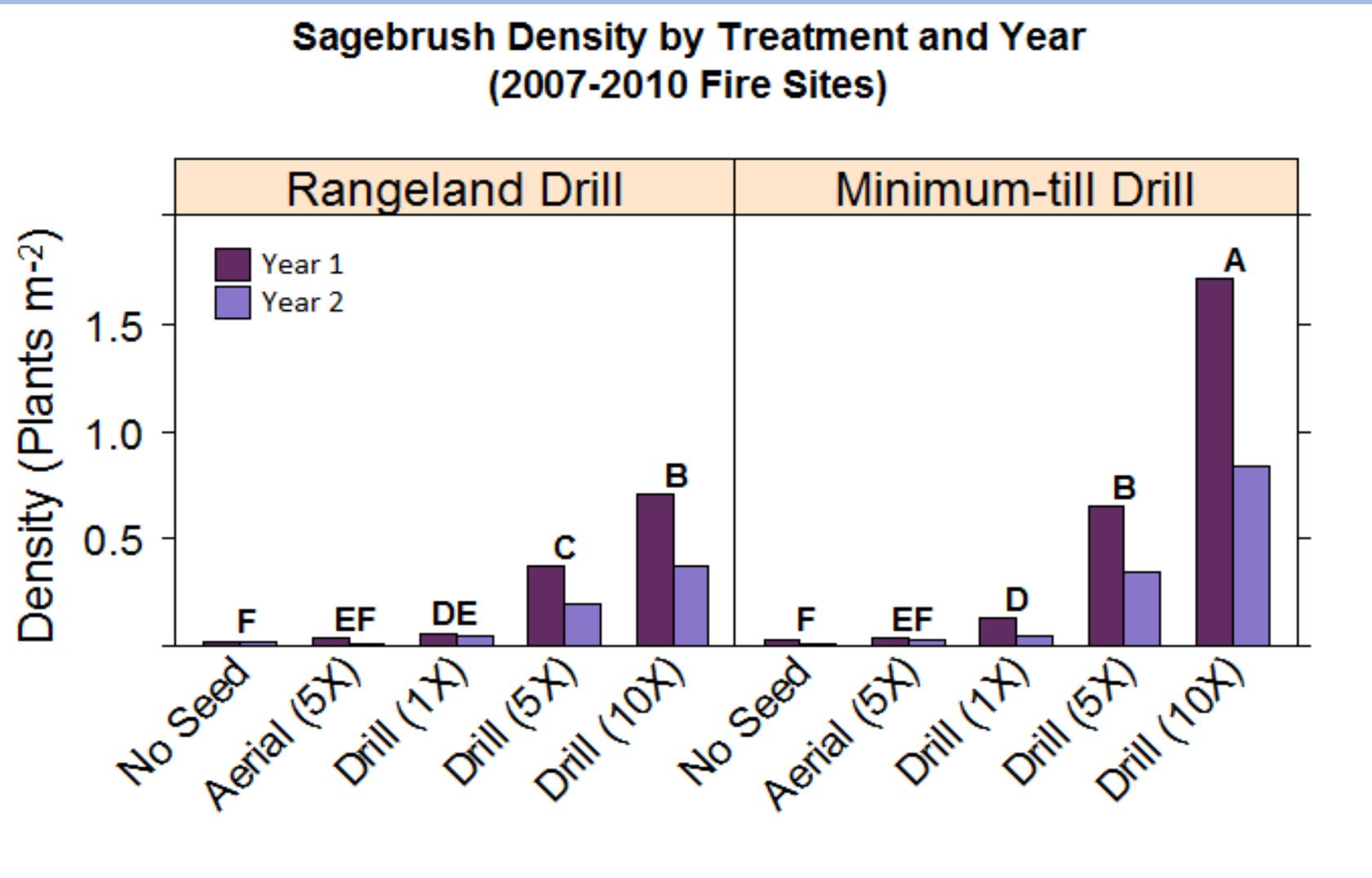


Survival



Growth

Effect of drill type in sagebrush seeding



Outplanting sagebrush seedlings can be cost effective



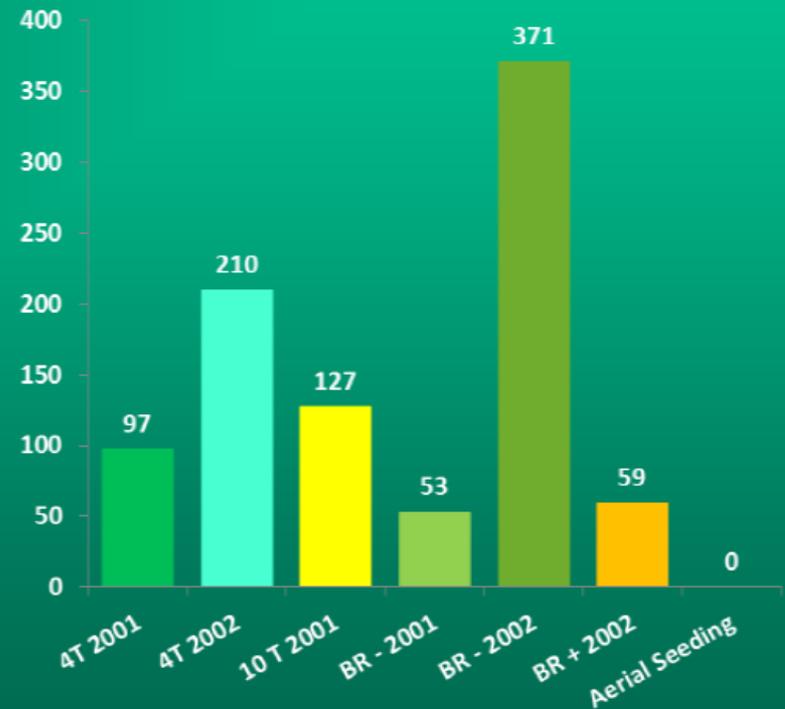
U.S. Fish & Wildlife Service

Economic Comparison

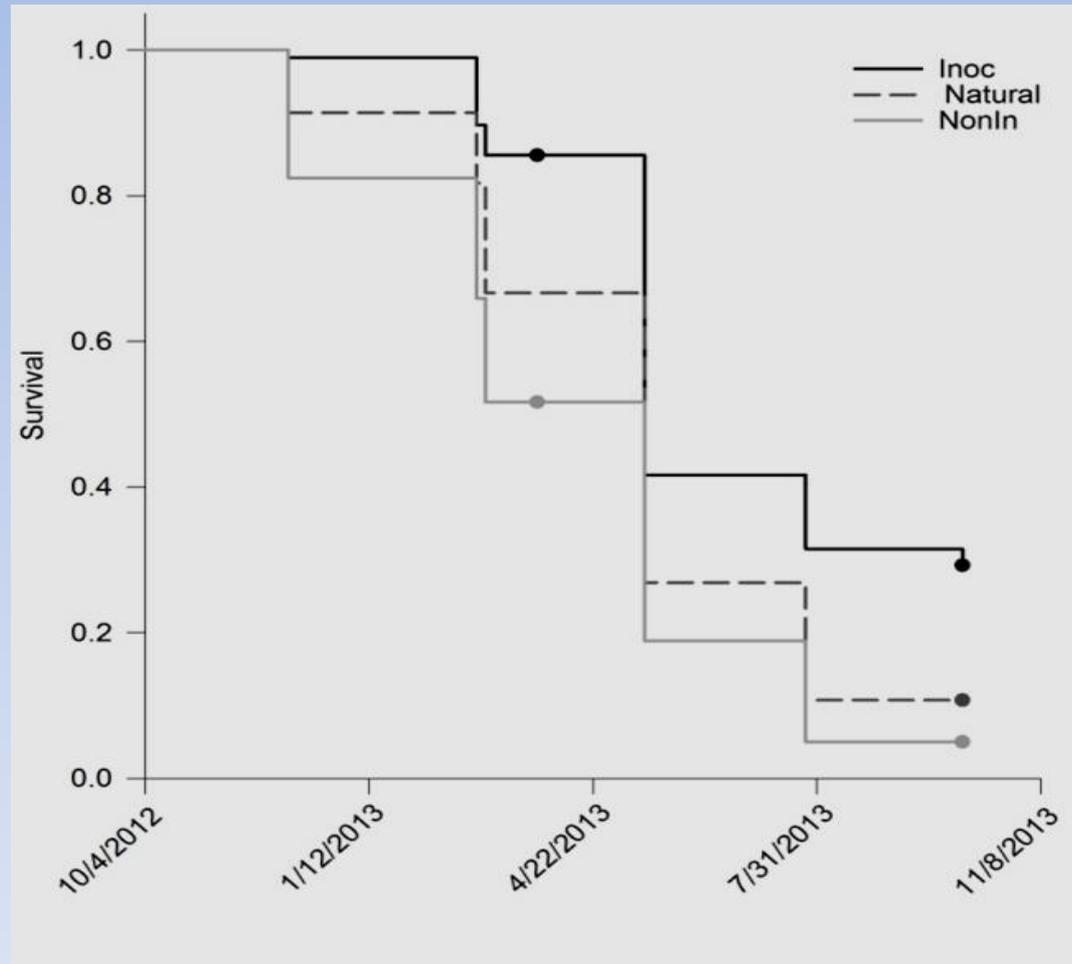
Initial Cost Per Acre by Stock type



Resulting Plant density per acre



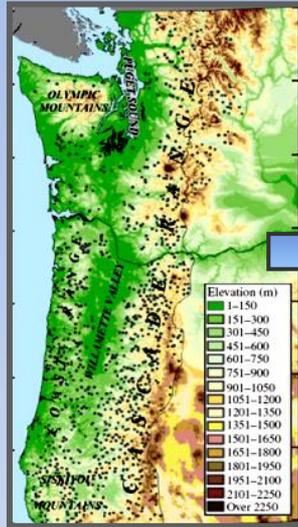
Mycorrhizal inoculation to increase sagebrush seedling survival



Bunchgrass and seed zones

Seed zones are constructed using data from common garden studies

Collect seed from many sources



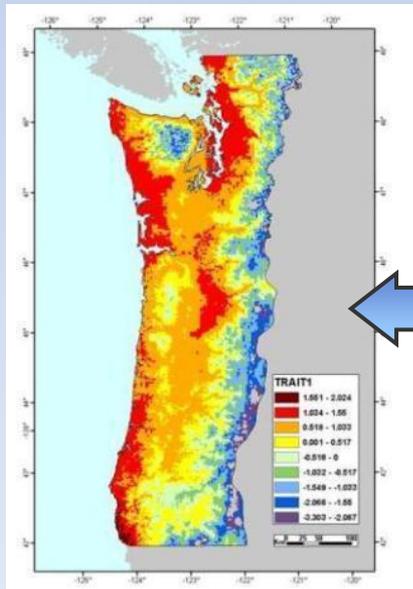
Grow families in a common environment



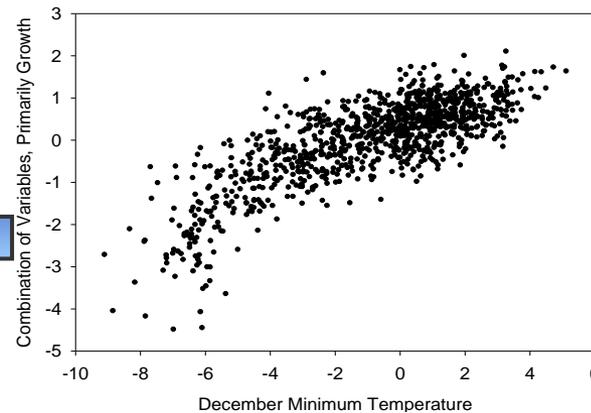
Measure many adaptive traits



GIS

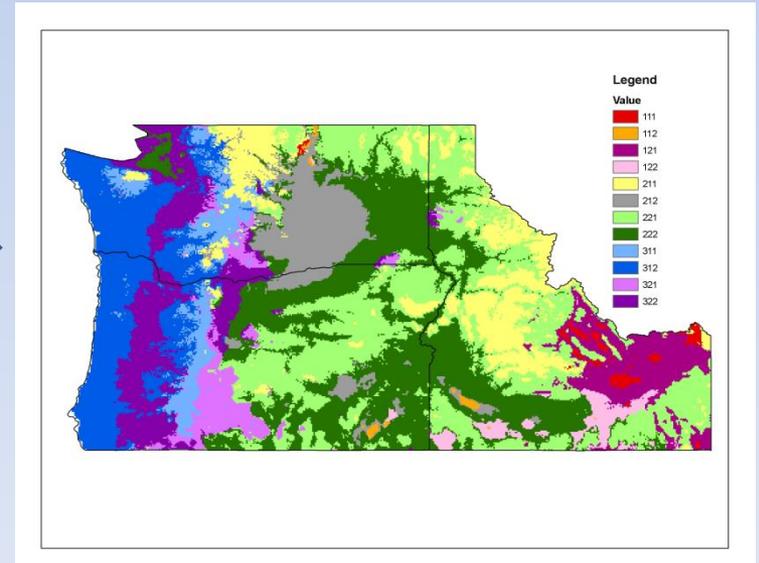
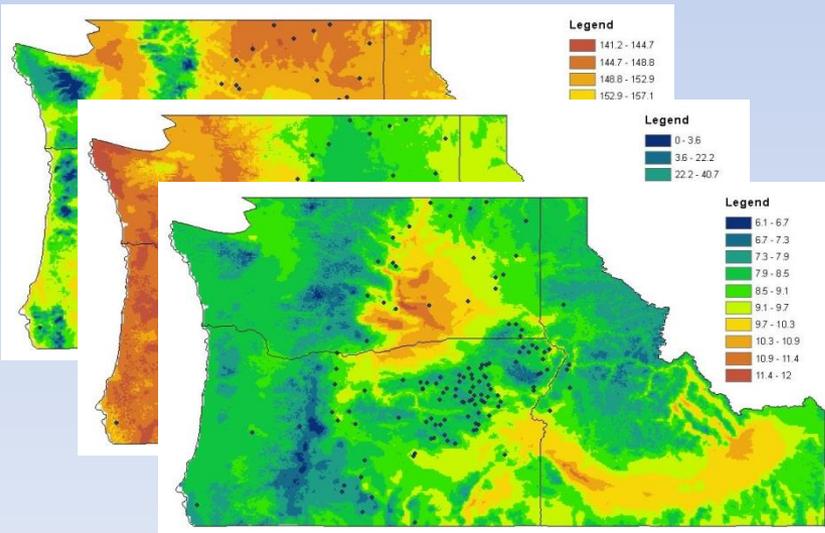
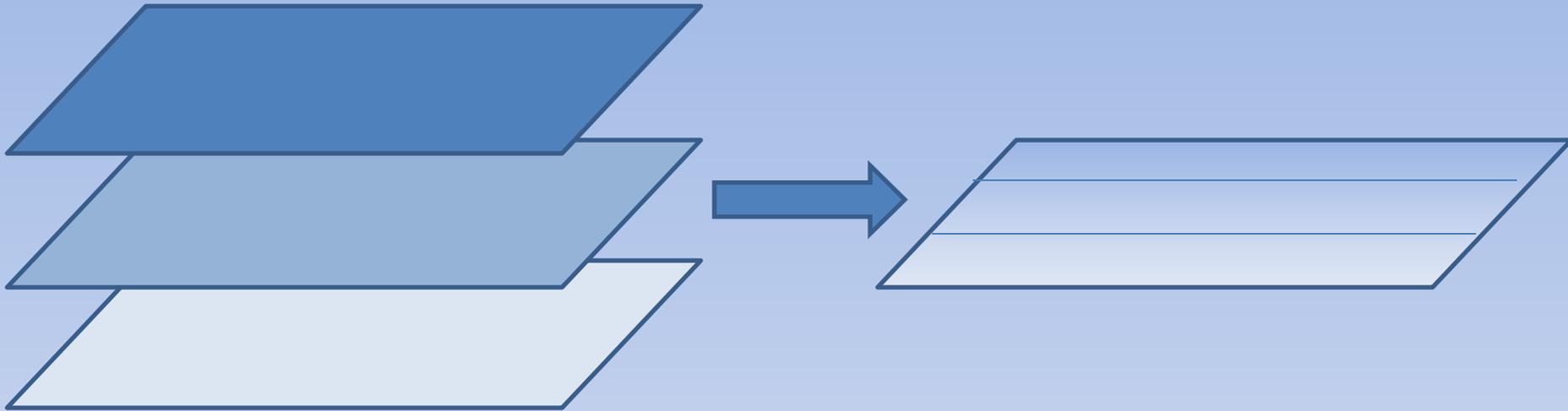


Douglas-Fir of Western OR and WA

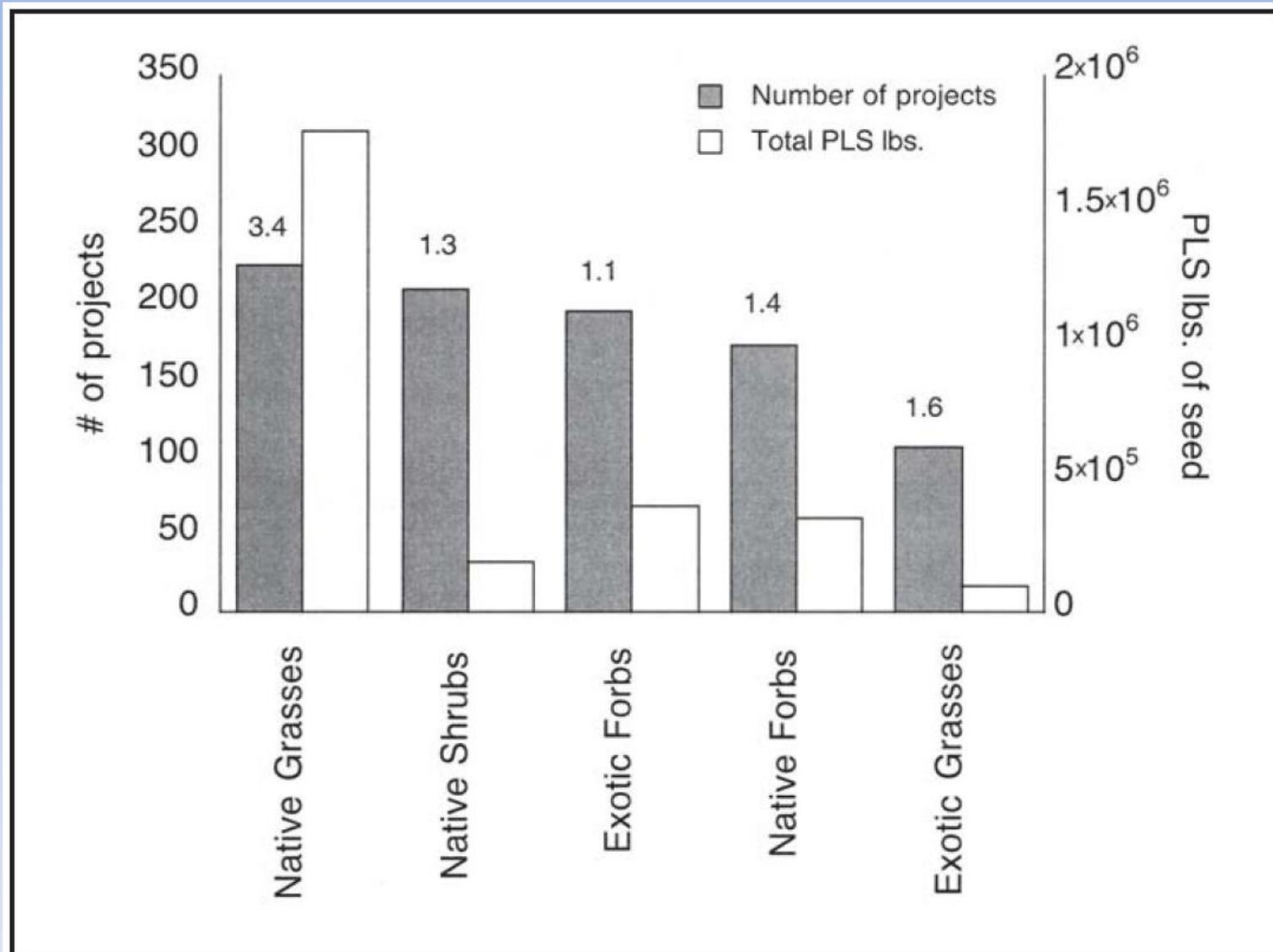


Traits vs source environment

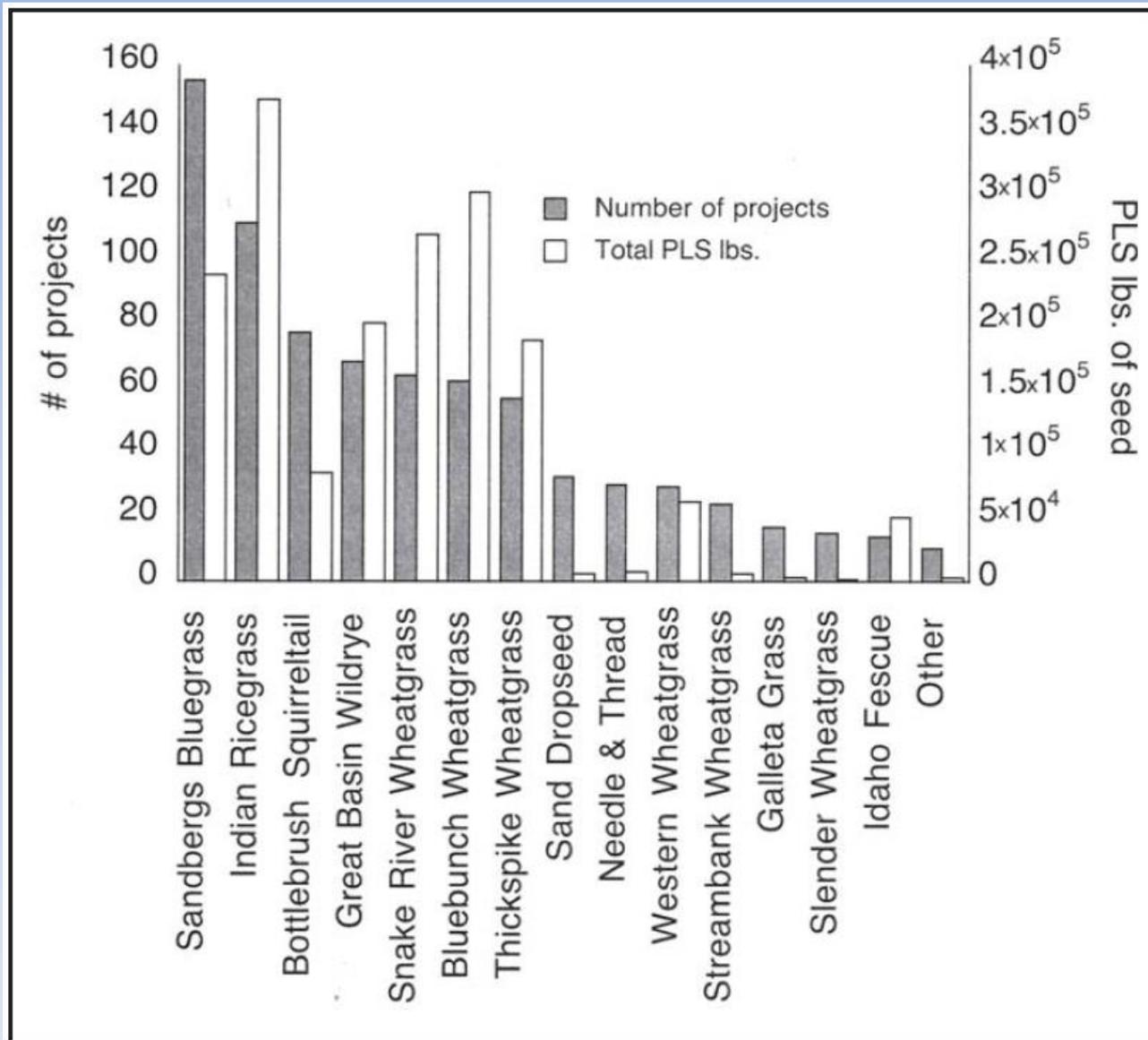
Trait layers are combined to determine seed zones



Importance of native grasses in post-fire restoration



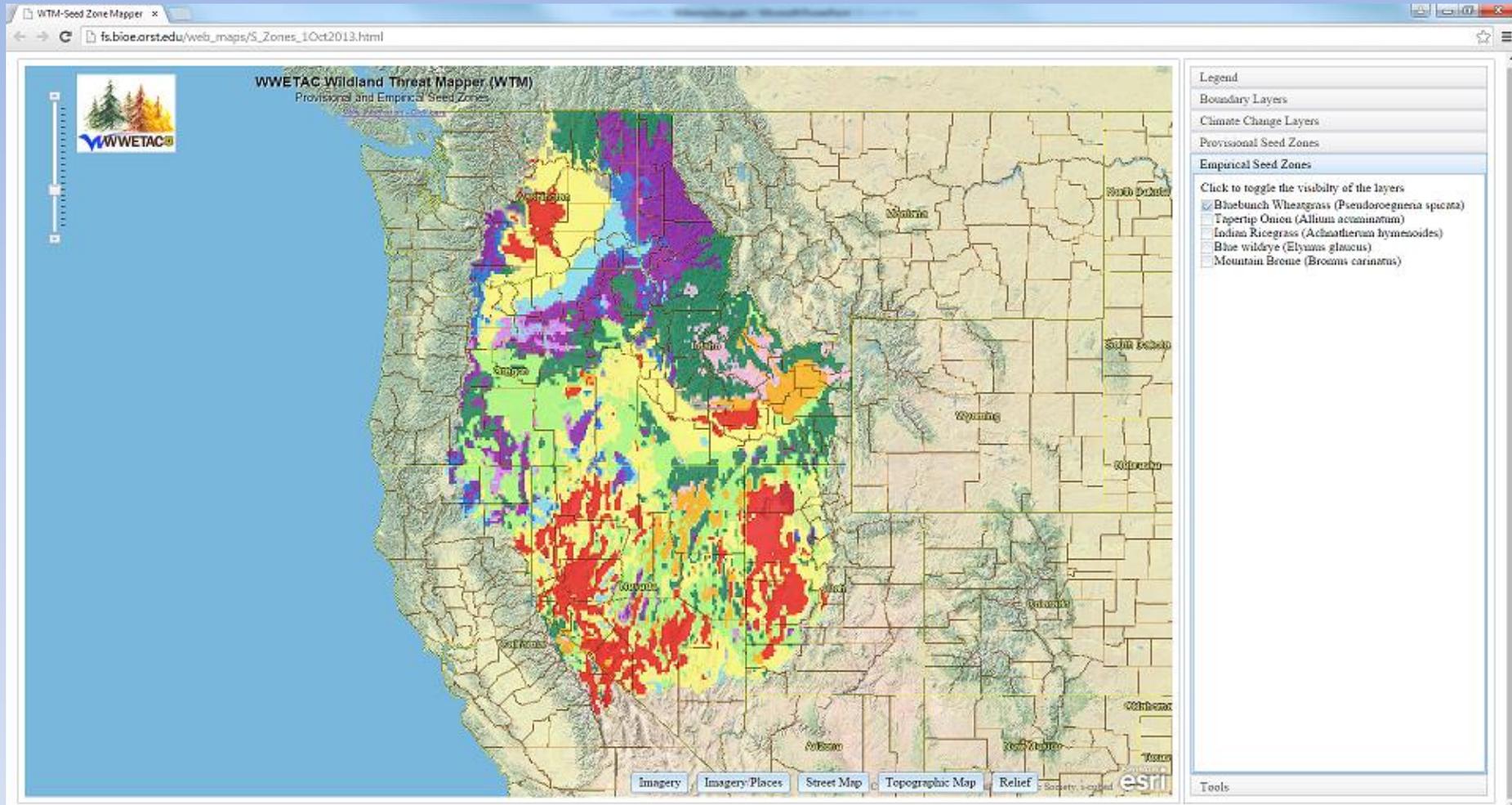
Importance of native grasses in post-fire restoration



Bunchgrasses with empirical seed zones

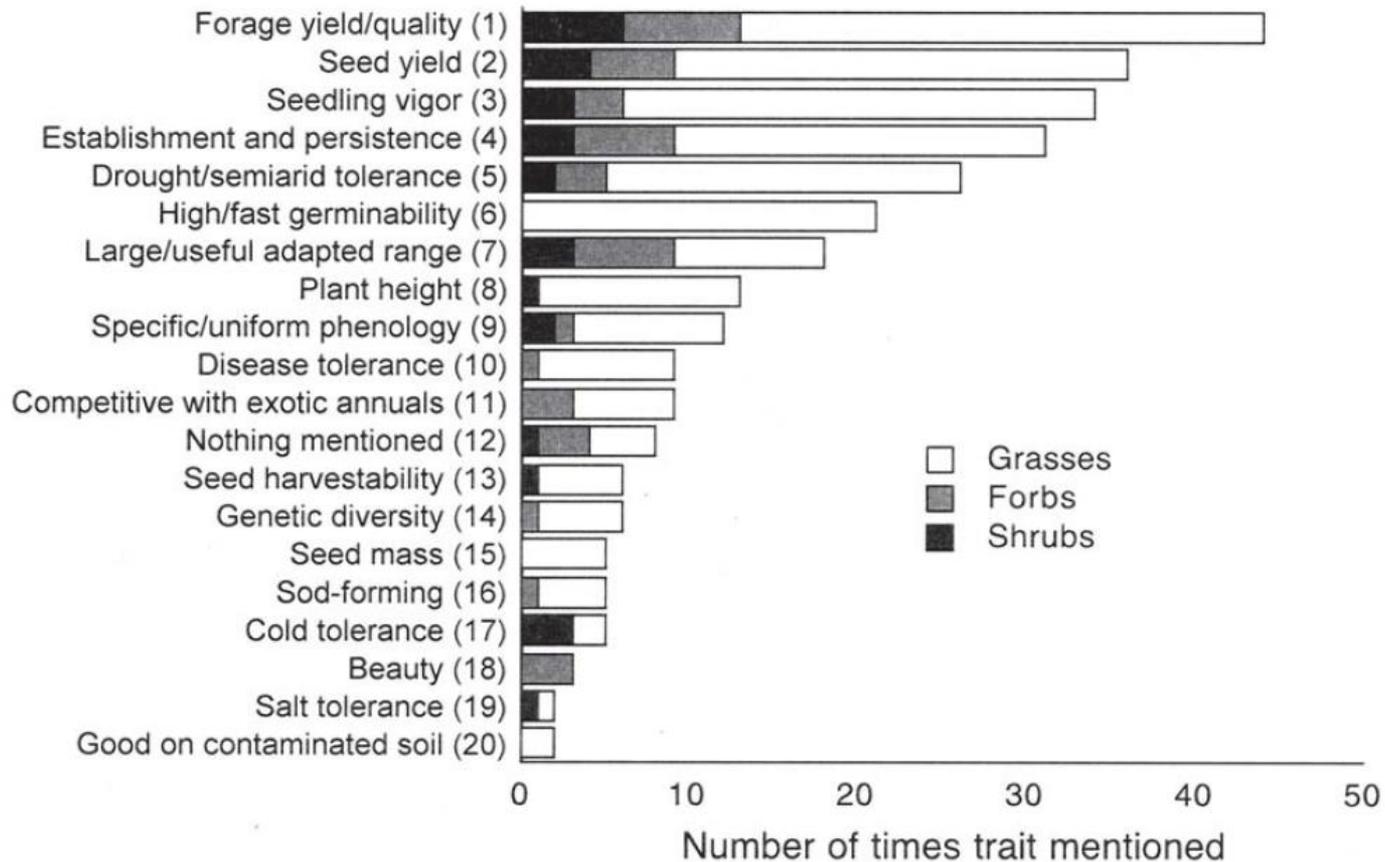
Common name	Species name	Journal	Year
Blue wildrye	<i>Elymus glaucus</i>	Canadian Journal of Botany	2004
Mountain brome	<i>Bromus carinatus</i>	Botany	2010
Indian ricegrass	<i>Achnatberum hymenoides</i>	Rangeland Ecology and Management	2012
Bluebunch wheatgrass	<i>Pseudoroegneria spicata</i>	Evolutionary Applications	2013
Sandberg bluegrass	<i>Poa secunda</i>	Evolutionary Applications	2015
Prairie junegrass	<i>Koeleria macrantha</i>	<i>in progress</i>	2015*
Bottlebrush squirreltail	<i>Elymus elymoides</i>	<i>in progress</i>	2016*
Basin wildrye	<i>Leymus cinereus</i>	<i>in progress</i>	?
Thurber's needlegrass	<i>Achnatberum thurberium</i>	<i>in progress</i>	?

WWETAC Wildland Threat Mapper



http://fs.bioe.orst.edu/web_maps/Seed_Zones.html

Important traits for restoration



- Root and leaf traits are rarely considered

Sage-grouse habitat forb restoration

Germination ecology of Great Basin forbs

University of Nevada, Reno and GBNPP

Investigated 10 Great Basin forb sage-grouse food species

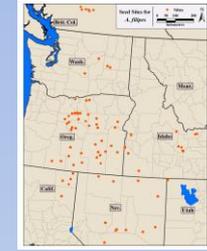
- Four species displayed generalist strategies
- Three species possessed high levels of dormancy
- Five species germinated at cold temperatures
- Three species germinated best after cold stratification
- Two species preferred no cold stratification
- **All species had population level differences**



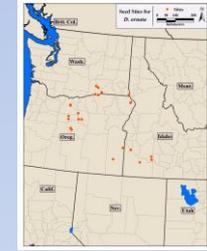
Partnership to develop native legume species

ARS Forage and Range Lab and GBNPP

Basalt milkvetch
(*Astragalus filipes*)



Western prairie clover
(*Dalea ornata*)



Searls' prairie clover
(*Dalea searlsiae*)



Utah trefoil
(*Lotus utahensis*)



Partnership to increase Nevada-specific seed sources for important sage-grouse species

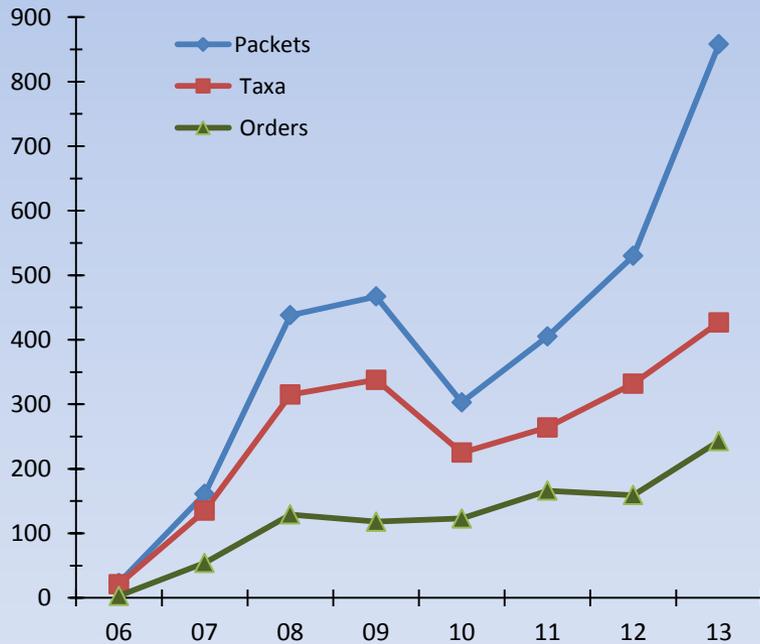
USFW Nevada, BFI Native Seed LLC, and USFS RMRS

FAMILY	Genus	Species	Common Name	Provisional Seed Zone	Generation	Cleaned Weight (g)	Cleaned Weight (lbs)	State	County	Elev.
ASTERACEAE	Agoseris	grandiflora	Big flower Agoseris	20 - 25 F. / 3 - 6	G1	1067	2.35	NV	Humboldt	5589
ASTERACEAE	Agoseris	grandiflora	Bigflower agoseris	20 - 25 F. / 3 - 6	G0	165	0.36	NV	Humboldt	5589
ASTERACEAE	Erigeron	speciosus	Aspen fleabane	15 - 20 F. / 3 - 6	Seed increase field**			NV	Elko	6700
ASTERACEAE	Erigeron	speciosus	Aspen fleabane	15 - 20 F. / 3 - 6	G1	47.63	0.11	NV	Elko	6700
APIACEAE	Lomatium	dissectum	Fernleaf biscuitroot	10 - 15 F. / 6 - 12	G0	281	0.62	NV	White Pine	5600
APIACEAE	Lomatium	dissectum	Fernleaf biscuitroot	15 - 20 F. / 2 - 3	G0	550	1.21	NV	Elko	7255
CAPPARACEAE	Cleome	lutea	yellow spiderflower or yellow beeplant	15 - 20 F. / 6 - 12	G0	155	0.34	UT	Beaver	5218
MALVACEAE	Sphaeralcea	grossulariifolia	Gooseberryleaf globemallow	15 - 20 F. / 6 - 12	G0	3513	7.7	UT	Millard	5387
MALVACEAE	Sphaeralcea	munroana	Munro's globemallow	10 - 15 F. / 6 - 12	G0	104	0.23	NV	Elko	6119
POACEAE	Leymus	cinereus	Basin wildrye	10 - 15 F. / 6 - 12	G0	1800	3.97	NV	White Pine	6053
POACEAE	Leymus	cinereus	Basin wildrye	20 - 25 F. / 6 - 12	G0	2050	4.52	NV	Humboldt	5000
POACEAE	Leymus	cinereus	Basin wildrye	15 - 20 F. / 6 - 12	G0	3700	8.16	NV	Elko	5990
POACEAE	Leymus	cinereus	Basin wildrye	20 - 25 F. / 3 - 6	G0	288	0.63	NV	Humboldt	6000
POACEAE	Leymus	cinereus	Basin wildrye	20 - 25 F. / 6 - 12	G0	312	0.69	NV	Washoe	4428

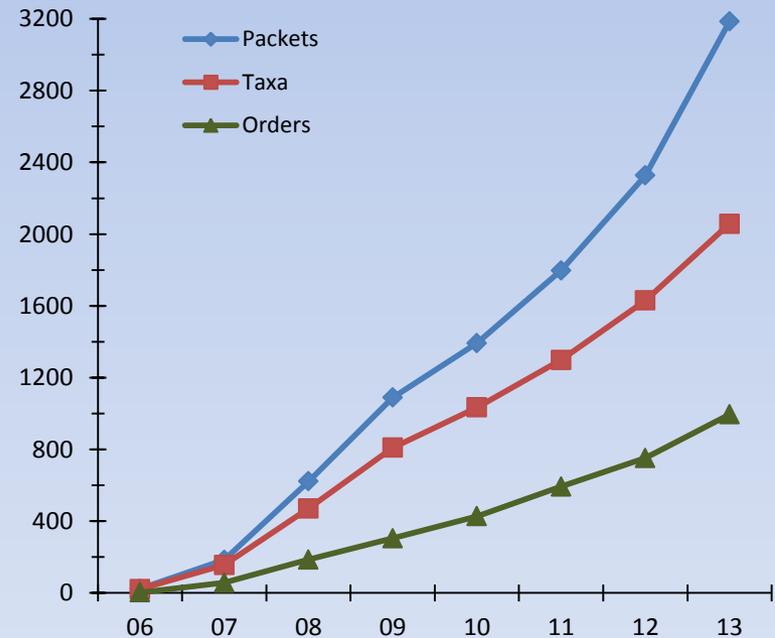
Kulpa, Benson, Jensen , and Kilkenny

Seed distribution through ARS Pullman/SOS/GBNPP partnership

SOS distributions by year



Cumulative SOS distributions



Acknowledgements



Great Basin Consortium

USDI Bureau of Land Management

USDA Forest Service

Plant Conservation Alliance

Seeds of Success

Great Basin Consortium

Great Basin Cooperators



COOPERATORS

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Brigham Young University, Provo, UT

College of Western Idaho, Nampa, ID

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Oregon State University Malheur Experiment Station, Ontario, OR

Private Seed Industry

Texas Tech University, Lubbock, TX

Truax Company, Inc., New Hope, MN

University of Idaho, Moscow, ID

University of Idaho Parma Research and Extension Center, Parma, ID

University of Nevada, Reno, NV

University of Nevada Cooperative Extension, Elko and Reno, NV

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